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Plant Protection Division

1970¹¹²

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

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May 1971

PROGRESS REPORT, PLANT PROTECTION DIVISION, 1970

INTRODUCTION

The reorganization of the Plant Protection Division started in 1969 was implemented during the year. The realignment from the former functional-type organization (survey, regulatory, control) to a program-oriented structure was effected. Staff positions were established for the following broad areas of program responsibility: cereal and forage pests, cotton and rangeland pests, forest and soil pests, fruit and vegetable pests, and nematodes and plant diseases. Related support activities involving methods development and environmental quality were strengthened by establishing these functions as separate branches; however, the Environmental Quality Branch was transferred to Environmental Protection Agency December 2, 1970. Staffs at Division regional field offices have been reduced, placing increased responsibility for program operations and the decision-making process at the State and district levels.

In cooperation with the State of Florida, a concerted effort is being made to achieve eradication of the giant African snail in the Miami area, and the West Indian sugarcane root borer in citrus groves around Apopka, Fla. No significant change in the distribution of these two pests was recorded, but biometric surveys were intensified to detect additional spread should it occur. Research on both pests continues in an attempt to accomplish eradication.

The biometric survey begun in 1968 on the citrus blackfly program continues to be highly effective in locating new infestations. Rapidly increasing populations of this pest required additional suppressive control treatments in East Mexico. In spite of the seriousness of the East Mexico infestations, the insect has not been detected in West Mexico or the United States.

Population increases of the gypsy moth recorded throughout several States in the Eastern Region necessitated increased regulatory efforts. The major area of concern was the threat of long-distance spread of the pest on mobile homes.

The Division's newest pest problem developed as a result of the detection of larval infestations of the European crane fly in Whatcom County, Wash. Emergency quarantine regulations were immediately enacted to protect agricultural interests while the potential impact of the problem was undergoing assessment. A State quarantine went into effect in October. This crane fly species is established throughout the Fraser Valley of British Columbia where insecticidal controls are employed to prevent heavy feeding, primarily on turf and pastures.

The value of early detection and prompt eradication action was effectively demonstrated by cooperators following discovery of specimens of the oriental and Mexican fruit flies in southern California. Sterile insects from the

Division's rearing facility in Mexico were released to eliminate the Mexican fruit fly threat. Intensification of trapping and limited use of a bait spray applied from the ground apparently eliminated an oriental fruit fly infestation.

The review of all programs was continued to determine where, if possible further reduction might be made in the use of the persistent pesticides. Use of dieldrin to control soil pests was severely curtailed and replaced by chlordane. Solutions to control and regulatory pesticide treatment problems are sought without jeopardizing efficacy of treatment. Increased emphasis is being placed on biological controls and broader integrated pest management approaches. Examples are the boll weevil eradication pilot test in Mississippi, further refinement in the pink bollworm sterile release program, and the return to milky spore disease applications at airports for Japanese beetle suppression.

The filing of an injunction against the Secretary of Agriculture by the Environmental Defense Fund and the Committee for Leaving the Environment of America Natural (CLEAN) to stop the imported fire ant program attracted major attention during the latter part of 1970. The situation had not been resolved at the end of the calendar year.

BARBERRY ERADICATION

The barberry eradication program is conducted in 19 States. In 1970, 2,457 square miles were surveyed and 2,774 square miles were placed on maintenance. As of December 31, 1970, 5,550 square miles still required initial work and 13,175 square miles required rework compared to 6,436 and 14,746 square miles respectively at the end of 1969. The total area on maintenance at the end of 1970 was 1,054,600 square miles.

During the year over 3 million barberry plants were destroyed and 1,165 regulatory nursery or environs inspections or both were made. A pilot wheat stem rust survey was conducted in 1970 in Iowa, Minnesota, North Dakota, South Dakota, and Montana. This survey will be modified and conducted in Wheat Ecological Zone 6 in parts of South Dakota, North Dakota, Montana, and Minnesota in 1971. The objective of the pilot program is to develop a statistically sound wheat stem rust survey in principal grain-growing areas to evaluate stem rust incidence and to provide samples for the determination of physiological race patterns.

BLACK GRASS BUGS

Since 1968, the grass bug complex of Labops spp. and Irbisia spp. have become damaging to rangeland reseeded to wheatgrasses. Treatments were applied to prevent severe damage to valuable grazing. In 1970, high population levels were controlled on 28,512 acres in Coconino County, Ariz., and on 384 acres in Baker County, Oreg. Malathion ultra-low volume (ULV) application of 8 ounces per acre was used.

BOLL WEEVIL

Pheromone trapping tests were continued on the Texas High Plains in 1970. Traps baited with live male weevils were used extensively during the year. Movement of weevils can be monitored effectively during the spring and late fall, although traps will not detect midsummer movement. Several preparations of grandlure, a synthetic bait, were tested and were found to be about 80 to 85 percent as effective as traps baited with live weevils. The rapid evaporation of grandlure has been a problem. In traps dental wicks saturated with grandlure were found to be superior to treated pellets. Pheromone trapping has eliminated the need for ground trash surveys on the High Plains control program.

Control tests conducted during the past 2 years on the High Plains using the systemic insecticide aldicarb (Temik) combined with the intensive pheromone trapping indicate overwintered populations can be reduced approximately 80 percent.

Spring and summer surveys in west Texas indicated that the boll weevil had spread to the Southwest with some additional finds on the High Plains. Overall, however, the distribution pattern of infestations was similar to that of 1969. A total of approximately 1,170,000 acres was treated in the fall of 1970 with ULV malathion. This was about 450,000 acres more than the 1969 total. Aldicarb was used on approximately 1,100 acres in the northern treatment area of the High Plains. Malathion was applied at the rate of 1 to $1\frac{1}{4}$ pounds of active ingredient per acre, and aldicarb was applied at the rate of 1 pound actual per acre (10 percent granules) as an infurrow treatment at planting time. From four to seven applications were in the fall program, depending on infestations or frost dates or both. Chemical treatments in west Texas were concentrated in the infested fields above the Cap Rock on the High Plains and to the southwest. In general, populations above the Cap Rock were considerably lower than in 1969.



New 7,000 gallon malathion bulk tanker replaces 55 gallon drums on High Plains boll weevil program saving 80 cents per gallon in program costs.

Treatments with ULV malathion were continued during 1970 in the Big Bend area of Texas along the Texas-Mexico border. Approximately 4,400 acres, consisting of scattered, small fields were treated to prevent the pest from becoming established in areas to the west not now infested. The weevil is now being contained along the border about 125 miles south of El Paso.

In the 1970 calendar year, 1,174,537 aggregate acres were treated in Texas and Mexico. Surveys were conducted on 1,254,420 acres in three States and Mexico: 1,224,460 in Texas, 20,841 in Arizona, 2,356 in New Mexico, and 6,763 in Mexico.

A small pilot test in the South comprising about 4,000 acres was initiated within the area selected for the large-scale boll weevil eradication trial. This test was started in the fall of 1970. Fall diapause spray applications were applied to test areas located in southeastern Louisiana, southwestern Mississippi, southeastern Mississippi, and southwestern Alabama.

Aerial applications were made with both helicopter and airplane. The helicopter applications appeared to be more effective in some areas. Malathion was used at $3/4$ and 1 pound per acre rates. Desiccants, defoliants, and stalk pullers were tested. In addition to the diapause spray program, the test included continuous survey.

A boll weevil rearing facility was established at Gulfport, Miss., and by the end of the year rearing was underway. These weevils will be used for trapping and sterile release activities. Sterile boll weevils from the Entomology Research Laboratory at Starkville, Miss., were released via airplane to test the feasibility of using sterile insect control techniques in the large-scale program.

BURROWING NEMATODE

Burrowing nematode is a major pest of citrus in Florida. Infested trees eventually become nonproductive and the annual damage is estimated at approximately $\$7\frac{1}{2}$ million.

During 1970, 45,404 acres were surveyed and 406 trees were found infested. Automatic shaker screens were installed on all tractor mounted augers to facilitate the soil survey. The State of Florida destroyed infected trees and treated 379 acres of citrus with the fumigant dichloropropane-dichloropropene mixture (D-D). Chemical barriers were established on 98,450 feet and 1,917,481 feet of barriers were maintained.

The State requires that growers replant treated soil with resistant rootstocks. There are two resistant and three tolerant rootstocks available. Replanting with 'Milam' or 'Ridge Pineapple' rootstock may take place immediately following the 6-month period of clean cultivation after fumigation. The burrowing nematode has not survived more than 9 months in the presence of these two rootstocks.

CARIBBEAN FRUIT FLY

Surveys indicate a decrease in numbers of Caribbean fruit flies during 1970 in the 29 infested Florida counties compared with peak populations in 1968 and 1969. With the aid of an Agricultural Research Service grant, the University of Florida established a Caribbean fruit fly rearing facility at its Subtropical Research Station, Homestead, Fla. A cooperative sterile insect release test was initiated in Key West in late 1970 to determine the feasibility of this technique as a means of control. Sterile flies are released directly from aircraft without benefit of a protective container. Participants in this test included the Florida Department of Agriculture, University of Florida, and the Entomology Research Division and Plant Protection Division of ARS.

PPD Methods Development personnel modified a pink bollworm release unit to make it suitable for fruit fly releases. Mounted in a twin-engined aircraft, it is capable of distributing 300,000 flies in a single flight.

Upon completion of these trials, a determination will be made as to the feasibility of extending this technique to other parts of Florida infested with Caribbean fruit fly. The test is also expected to provide valuable information which will be useful in the eradication of other exotic fruit flies that might gain entry into the United States.

CEREAL LEAF BEETLE

Detection surveys revealed 30 new counties infested in Illinois, Kentucky, and Maryland. Canadian officials report 16 counties infested with cereal leaf beetle in Ontario. Extreme cold and windy conditions delayed the spring control work to the extent that adults were laying eggs before the insecticide application was completed. Aerial treatments with ULV malathion at the rate of 3 ounces per acre were made to 12 scattered blocks totaling approximately 118,000 acres in Illinois.

Quarantine regulations were liberalized to permit movement of untreated regulated products to areas east of the Mississippi River, with the exception of Vermont and Florida. This greatly reduced the fumigation workload for hay and straw in the infested areas. Very few regulated commodities move into Vermont. Fumigation stations were established at Brunswick and Valdosta, Ga., to fumigate hay and straw moving into Florida.

The cereal leaf beetle egg parasite, Anaphes flavipes, released in Indiana, Michigan, Ohio, and Pennsylvania appears to be well established in southern Michigan. Recoveries have been made in Indiana and Ohio. The larval parasite, Tetrastichus julis, has been released in Michigan, Indiana, and Ohio and recovered in two separate areas in Michigan. Plans are underway to accelerate the rearing and release of the egg parasite at the Niles, Mich., facility. The rearing and release of larval parasites will be accelerated at Gulf Lake in Michigan and at sites to be selected in other infested States.

CITRUS BLACKFLY

Citrus blackfly has continued to spread within the East Mexico chemical control zone despite efforts taken towards its containment. Surveys detected 54,143 infested trees. This number represents a sizable infestation based on the biometric survey conducted throughout the citrus regions of Mexico. Adjacent to the U.S.-Mexico border, infestations were eradicated in the municipios of Matamoros, Reynosa, and Nuevo Laredo. Eradication treatments were also completed in the city of Monterrey. In Linares and Montemorelos, two of the major citrus producing areas of northeast Mexico, control measures were taken to check further spread. In all, eradication and suppressive control treatments were applied to a total of 792,699 citrus trees. The insecticide used was 41.9 percent carbophenothion emulsion, applied at the rate of 1 pound of toxicant per 100 gallons of water. Three applications are required at 30-day intervals. Applications are made by personnel of the Mexico Department of Agriculture.

Colonization of citrus blackfly parasites began in the more generally infested locations north of the biological barrier zone. Good collection sites for parasites were scarce in the biological control zone. This scarcity decreased the rate of colonization considerably and increased the necessity for spot insecticide treatments to reduce citrus blackfly populations.

Northwestern Mexico continued free of citrus blackfly in spite of a 300-percent increase in citrus plantings in Central Sonora during recent years. Methods development tests were initiated to find suitable eradication and suppressive insecticides which can be applied more rapidly or economically than the one presently recommended. These tests are cooperative with the Mexico Department of Agriculture, Direccion General de Sanidad Vegetal. Tests were also initiated in cooperation with Entomology Research Division, ARS, to determine the feasibility of utilizing infrared photography for detection surveys.



Inspectors of Mexico's Direccion General de Sanidad Vegetal check a citrus shipment from the biological control zone going into the chemical control zone to insure that it is free of citrus blackfly infested leaves.

EUROPEAN CHAFER

No significant spread of the European chafer was found in the 1970 detection survey program. Positive trap finds in Connecticut, Massachusetts, New York, and Pennsylvania were just outside the currently regulated area. Trapping in Ohio was negative.

Granular chlordane was applied to 87 acres at Providence, R.I., to complete an eradication treatment started in 1969. Soil treatments were also applied to 63 acres in Massachusetts and 39 acres in East Cleveland, Ohio. In Massachusetts, 25 percent granular chlordane was applied at 5 pounds actual toxicant per acre by helicopter to 435 acres in the Greater Boston area where extension of infestations was found this year. Additional acreage was treated with ground equipment.

As a result of on-site reviews in New York, the Rochester and John F. Kennedy Airports were approved for chlordane turf treatments. The reviews were conducted by personnel from the New York Environmental Conservation Department, Federal Water Quality Administration, U.S. Bureau of Sport Fisheries and Wildlife, and PPD. Final approval came too late for treating the airports this year and the work is planned for spring of 1971.

In Luzerne County, Pa., 91,000 marked, sterile male chafers were released in a continuing study by Entomology Research Division to determine the effectiveness of sterile males in suppressing local chafer populations. Candidate insecticides were screened in efforts to find a substitute for the chlorinated hydrocarbon insecticides.

EUROPEAN CRANE FLY

Adults of the European crane fly, Tipula paludosa, originating from the generally infested areas of the Fraser Valley in British Columbia have been trapped since 1966 in several locations in northwestern Washington. The initial larval infestation of this pasture, lawn, and crop pest was discovered in Whatcom County, Wash., on March 18, 1970.

Federal emergency plant pest regulations applicable to the portion of Whatcom County infested with European crane fly became effective on June 11, 1970. Articles requiring a certificate or permit to move from the infested area include soil, plants, grass sod, and used mechanized cultivating and earth moving equipment. The State invoked a quarantine in October to regulate the intrastate movement of such articles. Quarantine regulations are also in effect in Canada.

Compliance agreements were completed with nine nurseries that ship plant material interstate. Eight of the nurseries were treated with granular chlordane at the rate of 5 pounds actual toxicant per acre. One nursery ships only bare rootstock. Seven nurseries involved with intrastate shipping were treated with chlordane under supervision of State inspectors.

Tests with the orthodichlorobenzene (ODCB) irritant revealed that first-instar larvae can be detected quite easily. The small larvae are close to the soil surface and emerge immediately when the irritant is applied. Techniques using the irritant are the principal means of detection employed.

Emergence flights of the European crane fly in late summer were very heavy at several locations in northern Whatcom County, Wash. Thus far, blacklight traps appear to be a poor detection device for the insect. No extension of the regulated area was recommended as a result of the 1970 survey.

GAMMA GRASS RUST

A periodic check of the Fairchild Gardens, Homestead, Fla., in December 1969, by Agricultural Quarantine Inspection Division inspectors revealed a rust on gamma grass plantings (Tripsacum sp.). It was later identified as gamma grass rust, Physopella pallescens. This was its first recorded occurrence in the United States although it is known to be widespread in Mexico. It has also been reported in El Salvador, Nicaragua, and other Caribbean areas.

As it was suspected that P. pallescens could infect corn, an immediate hold order was placed on the Tripsacum sp. plants and surrounding soil. Plants were cut to ground level, vegetative growth and litter burned, then soil and clones were treated with repeat applications of a fungicide.

Taxonomists later reported the occurrence of a second rust, Physopella zeae, on Euchlaena sp. in the Fairchild Garden plantings intermixed with Tripsacum. A tropical rust, P. zeae is known to attack 67 varieties of corn and is commonly referred to as corn rust. Immediate measures were taken to eliminate P. zeae. All plants in the infested plots were removed and burned and the area fumigated with methyl bromide. Followup surveys have failed to reveal the presence of either rust within or near the Fairchild Gardens.

GIANT AFRICAN SNAIL

An infestation of the giant African snail was found in Miami, Dade County, Fla., on September 15, 1969. Shortly afterwards, a second infestation was detected a few miles away in Hollywood, Broward County. The snail has been found on 142 properties in North Miami and six properties in Hollywood. The infested properties approximate 20 acres in area.

For quarantine purposes, 477 properties are under State regulation. All leaves, grass cuttings, and other trash are collected and taken to a specified land fill which is so located that any snails in the debris would be unable to survive to make their way to a suitable habitat.

Surveys of the infested area are conducted on a biweekly basis. A biometrically designed survey has been in effect which assures 95-percent accuracy in the detection of individual snails assuming that all live snails on the sampling plot are detected. The survey covers all properties under regulation.

Treatments consist of applying pelleted bran bait containing 3.25 percent metaldehyde and 5 percent calcium arsenate to the infested properties at designated time intervals dependent on survey findings and prevailing weather conditions. During the rainy season, bait applications are made more frequently. Since the beginning of the program, snail populations within the infested areas have declined more than 95 percent and 205 properties have been removed from treatment.

In Hawaii, where this snail occurs, tests are being conducted to determine molluscicidal activity of new candidate materials selected by the Pesticide Chemicals Research Branch, Entomology Research Division. A total of 97 materials has been tested. Thirty-five of these have shown satisfactory results in initial screening tests and are now being tested in small plots in the field.

GOLDEN NEMATODE

The State of Delaware was removed from the Federal Golden Nematode Quarantine in March 1970. Statistically designed surveys which were made following eradication treatments indicated that the infestation in Delaware was eliminated. Originally the nematode was detected in New Castle County in February 1969.

Including New York, surveys were conducted on 78,676 acres in 13 States. The 1970 survey revealed 42 acres initially infested and 433 acres reinfested on Long Island. A total of 403 acres, 42 acres in Steuben County, N.Y., and 361 acres on Long Island, was treated with dichloropropane-dichloropropene mixture (D-D) (90 gallons per acre) or a mixture of methyl isothiocyanate (20 percent) and chlorinated C₃ hydrocarbons (80 percent) (Vorlex) (20 gallons per acre). All known infestations have been treated in Steuben County except the Cornell Research Farm.

Two nematode resistant varieties of potatoes, Wauseon and Peconic, are available to growers. Neither variety is enthusiastically accepted. Another resistant variety, NY 41, will be available to growers in 1973.

The mechanical soil sampling machine was used on a limited basis. The growers prefer to have the machine used before planting the cover crop in the fall. Harvest of early varieties of potatoes allows enough time for soil sampling before planting of the cover crop. However, there is a problem of timing the sampling period before planting the cover crop in fields in which late potatoes are grown.

GRASSHOPPER AND MORMON CRICKET

Grasshopper infestations increased slightly over those found in 1969 in several areas, but populations on rangeland in the West and Midwest generally have continued at low levels. Rainfall kept rangeland in good condition generally and only 131,884 acres required treatment in six States. These were in Arizona, California, Idaho, Nebraska, Washington, and Wyoming. Carbaryl, wettable powder in water, was applied at the rate of 8 ounces actual per acre

in Humboldt County, Calif., and malathion in ULV formulation was applied at the rate of 9.74 ounces actual in the other States. Good control was obtained with both insecticides. All applications were made by aircraft. Infested rangeland of eight or more grasshoppers per square yard totaled 7,928,039 acres in 15 States as determined by 1970 adult surveys. The States with largest infested acreage were Idaho (1,683,000), Oklahoma (2,300,000), and Texas (2,311,340).

Mormon cricket infestations remained at record low levels. In 1970, no control treatments were applied. The adult survey in 1970 indicated only 1,000 acres infested with potentially threatening populations in Oregon.

GYPSY MOTH

Gypsy moth was detected in 20 new counties in Delaware, Maryland, New York, Pennsylvania, and Virginia as a result of the annual adult survey. Male moths and egg masses were found in Somerset County, Pa., constituting the westernmost known infestation. Moths were also trapped in two northern Virginia counties and in one county on the Eastern Shore of the State, but no egg masses were found. A recently synthesized sex attractant called disparlure was used for the first time in detection surveys. Natural and synthetic lures were used previously.

In the cooperative Federal-State control program a total of 37,242 acres was treated with insecticide applied by aircraft in New Jersey, New York, and Pennsylvania. Elsewhere in the Region, more than 200,000 acres were aerially sprayed by States and local municipalities to suppress threatening populations. The insecticide used for the most part was carbaryl (Sevin 80-S) at the rate of 1 pound of the toxicant per acre. In Pennsylvania, ULV Dylox was applied to 3,360 acres at 1 pound of toxicant per acre.

The movement of mobile homes and camper trailers from infested sites to destinations outside of the regulated area was a major regulatory problem. Egg masses and pupae of the insect have been found attached to such vehicles. Hazardous mobile home parks and campsites were sprayed using both aircraft and ground equipment to reduce larval populations. Generally, carbaryl was applied at the dosage rate specified for control.

The Methods Development Laboratory at Otis Air Force Base, Boston, Mass., initiated tests to develop an effective certification treatment for mobile homes--a heat treatment is being evaluated. Investigations with new foreign parasites and the study of techniques to mass rear these species are receiving major emphasis. A total of 51,825,000 parasites was reared and released at selected sites in Delaware, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Virginia. A majority of these were Ooencyrtus kuwanae, an egg parasite. Screening of candidate parasites is being continued.

Several promising insecticides and new formulations of Bacillus thuringiensis were evaluated in field plot tests treated by aircraft. During the year, laboratory personnel played a major role in supporting the chemical research which led eventually to the development of the attractant, disparlure, for detection trapping. Additional tests are in progress to assess the potential of the synthetic attractant for control purposes.



Connecticut gypsy moth defoliation, July 1970, typical of extensive areas in the Eastern Region.



Male gypsy moths tethered for one of many bioassay tests of the type which eventually led to the discovery of the synthetic pheromone disparlure.

IMPORTED FIRE ANT

Mirex bait was applied to approximately 14.7 million acres. About half of the acreage treated was in Georgia. Other large-scale treatments were carried out in Louisiana, Mississippi, and South Carolina.

Surveys confirm that the infested area is increasing by natural spread. The increase this year amounted to 4.6 million acres. Total acres infested is 120 million. Quarantine lines have been extended to include these new areas.

Evaluation of research and eradication trials indicate that eradication of the imported fire ant is technically feasible. However, due to inadequate Federal and State funding to assure proper timing of applications and public opposition to the large-scale use of mirex, there are no plans to pursue an eradication program at this time.

Scientists in the Entomology Research Division have initiated an intensive survey program for alternate chemicals to substitute for mirex should registration of this material be canceled. To date, over 150 new materials have been tested. None of the chemicals tested, with the exception of chlorinated hydrocarbons, come close to mirex in effectiveness.

On August 5, the Environmental Defense Fund and the Committee for Leaving the Environment of America Natural (CLEAN) filed an injunction in the U.S. District Court for the District of Columbia against the Secretary of Agriculture to stop the imported fire ant program. Attorneys for the Department of Justice responded on October 15 with a motion to dismiss the injunction. The dismissal was denied, but under a stipulation mutually agreed to, the court decision is being held in abeyance pending the review of a statement filed with the Council on Environmental Quality.

Monitoring studies are being conducted in Georgia and South Carolina to assess the effects of mirex bait in terrestrial organisms. The Division has a contract with the U.S. Department of the Interior to monitor the estuarine organisms in the Charleston area of South Carolina. In the terrestrial monitoring studies in Georgia and South Carolina, mirex is being detected in a wide variety of organisms several weeks after treatment. Highest residues were found in birds, opossums, and shrews. The monitoring of the estuarine organisms in Charleston indicates that low levels of mirex are found in aquatic organisms and that these residues tend to disappear over a period of time.

Tests conducted during previous years had demonstrated that large aircraft, under certain crosswind conditions, could effectively double and, in some cases, triple the swath spacing when flown at 700 feet above terrain. This aerial treatment technique involves the simultaneous observation of wind data and swath spread by ground personnel. The procedure became operational on all large aircraft contracts during 1970, resulting in more uniform coverage, lower costs, and a higher safety factor.



Weather team using theodolite to measure wind velocity and direction for determining swath displacement for aerial application of mirex bait for imported fire ant.

JAPANESE BEETLE

Eighteen new counties were found infested during 1970 in the currently infested States. Cooperative Federal-State control treatments were completed at several isolated infestations to eradicate or retard natural spread of the beetle. In these treatments, 25 percent granular chlordane was used at 5 pounds of toxicant per acre. Adult beetle populations noticeably increased in older sections of the infested area requiring numerous carbaryl foliar sprays applied at the rate of 1 pound actual toxicant per acre to eliminate hazardous conditions at regulated industrial and transportation sites.

Integrated control efforts were initiated at seven airports in the regulated area utilizing the biological agent "milky disease" to supplement turf treatments with chlordane. A total of 1,397 acres at these airports was treated with milky disease spore dust applied at the rate of 2 pounds and 5 pounds per acre. The higher dosage rate used at airports was judged to be the most potentially hazardous to spreading adult beetles. Currently, 5,000 pounds of the spore dust is on hand for treating additional airport acreage in 1971.

Attractant tests indicated that one compound, phenethyl propionate, was superior to the phenethyl butyrate-eugenol lure presently used in survey traps. Phenethyl propionate lure will be phased into the 1971 trapping program.

In 1969 and again in 1970, much of Missouri and Illinois as well as selected areas in Michigan were trapped using a biometrically designed system. Field reports indicate that the new system has substantial merit. Positive trap catches were made in the three townships surveyed in Michigan. A large area of Chicago was found to be infested. The new technique requires less survey equipment, fewer trap tenders, and less time to install traps.

Nearly a 20-fold increase in area coverage and a reduction in survey costs were verified in Illinois using the new survey system. In 1969, for example, 2,796 traps captured 489 beetles using the old survey procedures while the 1970 biometrically designed system resulted in 889 traps capturing 547 beetles. Also, in Chicago, 2,800 man-hours were expended in surveying 35 square miles in 1969; in 1970, 1,400 man-hours were required to survey 362 square miles.

KHAPRA BEETLE

No established khapra beetle infestation has been found in the United States since 1966. In 1970, 7,892 properties were inspected in the United States and Mexico with negative results. Commodity treatments were supervised in four States involved with cargo moved inland from U.S. ports following discoveries of khapra beetle infestations aboard foreign ships. In East Mexico, 284 commodity treatments were supervised under similar circumstances.

MEDITERRANEAN FRUIT FLY

No Mediterranean fruit flies were trapped in 1970 in the United States or Mexico. Surveys are carried out each year to promptly detect an introduction of this serious pest. In the United States, the trapping program is concentrated in Florida, but traps are also operated in Arizona, California, Louisiana, and Texas. Through cooperative efforts with the Mexican Government, 4,100 traps are operated in that country. Most of the traps are placed along the Mexico-Guatemala border to detect spread from infested Central American countries. The 37,080 traps operated in Mexico and the United States during the year included 26,924 containing dual wicks and 10,156 with single wicks. Traps with dual wicks are used for detection of the Mediterranean fruit fly and other important foreign fruit flies, such as the oriental fruit fly and the melon fly. One wick contains an attractant specific for the Mediterranean fruit fly. The second wick contains a mixture of two additional attractants.

A thorough review was begun of the detection program in Florida. Rapid urban development and greatly increased numbers of foreign travelers entering the United States through Florida cities have increased the hazard of introduction of this dangerous pest. In order to assure that maximum protection is provided by the detection activity, a biometrical survey sampling system is being considered.

MEXICAN FRUIT FLY

Detection surveys yielded multiple catches of the Mexican fruit fly in California for the first time in 13 years. The first fly was trapped on March 3 at San Diego. Six additional flies were trapped in San Diego County during July, and seven in September. The finding of five flies in one trap at San Ysidro, San Diego County, Calif., on September 24, resulted in a California Department of Agriculture request for the release of 10,000 sterile insects at the catch site.

No flies were trapped in Arizona, Florida, or Louisiana. In the Lower Rio Grande Valley of Texas where flies appear annually due to migration from northeastern Mexico, nine native flies were trapped and two larval infestations confirmed.

In west Mexico, 15 native adults were trapped at Tijuana and Ensenada, Baja California. Over 23 million sterile flies were released in this area during 1970. The flies are reared and their pupae irradiated in a Cobalt 60 source at the PPD facility in Monterrey, Nuevo Leon, Mexico. From there, shipments are made weekly to Tijuana. Sterile fly pupae are placed in permanent release stations where they are allowed to emerge naturally and disperse widely throughout northwestern Baja California. The light infestation that was detected there in 1968 is now considered to have been eradicated as no native adults have been trapped since December 1968.

Citrus fruits shipped from Mexico to the United States require fumigation. PPD supervises these fumigations at various locations in Mexico on behalf of the Agricultural Quarantine Inspection Division. During 1970, 3,632 fumigations involving 188 million pounds of citrus fruit were certified by PPD

inspectors for shipment to the United States and other countries. Fumigations are also required on fruit moving out of the Lower Rio Grande Valley of Texas to other citrus producing States. Fumigation is required beginning December 1 until completion of fruit harvest which is generally about June 30 of the following year. In 1970, 1,548 fumigations were required involving 86 million pounds of citrus fruit.

ORIENTAL FRUIT FLY

Specimens of this serious pest were trapped in southern California between September 4 and October 12, 1970. Approximately 112 square miles of heavily populated urban area in a favorable warm climatic zone were involved. This was the sixth time in the last decade that oriental fruit fly has been found in California. Single flies were trapped at five locations in Garden Grove and Los Alamitos, Orange County and at two locations in Long Beach and Lakewood, Los Angeles County.

An intensive trapping pattern was immediately deployed around each of these finds. A total of 3,976 traps was used. Additional eradication measures taken involved the application of a bait consisting of gelled methyl eugenol (attractant) containing a small amount of naled (insecticide) and a thickening agent. Small amounts of this bait were distributed as large drops on tree branches or tree trunks in a 4 square mile area containing 1,143 properties. Bait applications were begun October 19 and completed December 1. Four applications were made. Fruit cutting failed to reveal larvae. Prompt cooperative efforts have again prevented establishment of this pest in the continental United States.

In 1969, a total of 18 flies was trapped in southern California, and one fly was trapped in Dade County, Fla.

PEACH MOSAIC

This disease was first reported in Colorado and Texas in 1931. The cooperative Federal-State program began in 1935. Peach mosaic presently occurs in Arkansas, Arizona, California, New Mexico, Colorado, Oklahoma, Texas, and Utah. In the absence of control, the commercial value of an entire orchard may be destroyed in 3 to 6 years. During calendar year 1970, over 1½ million trees were inspected in seven States. A total of 107 infected trees was found in three States: Colorado, Texas, and Utah. The majority of the infected trees was found in Colorado. Infected trees were removed by growers.

In 1970, the disease incidence was 0.007 percent compared with 0.003 percent in 1969.

PHONY PEACH

Symptom surveys were conducted on 4,196,163 trees in eight States. Infected trees were found in six States and 9,732 of the 10,012 infected trees were destroyed. The remainder of the trees are scheduled for destruction. The cost of removing infected trees is borne by the grower.

The incidence of phony peach was 0.24 percent in 1970 compared with 0.25 percent in 1969.

Fifteen nurseries were inspected and 110 transit inspections were made for phony peach. Two hundred acres of alternate hosts (wild plum) were treated.

PINK BOLLWORM

Approximately 185 million marked sterile moths were released in California, about 2 million in Arizona, and 7.7 million in the Florida Keys during the year. The moths were mass reared at the Plant Protection Division facilities in Phoenix, Ariz., and Brownsville, Tex. Of the 185 million released in California, 100 million were released in the San Joaquin Valley in Kern County against a small, light infestation. Approximately 92 percent of cotton grown in California is produced in the San Joaquin Valley. The rest of the cotton-growing area to the south is in the generally infested area adjoining Arizona to the west.

Approximately 85 million marked sterile moths were released in the Coachella Valley which is about 150 miles south of the nearest cotton grown in the southern end of the San Joaquin Valley.

The releases began in the Coachella Valley about April 15, 1970, but were discontinued early in August when populations became too high to be controlled by the sterile moth technique. Even though there was some evidence of general population suppression in the valley compared with other valleys in southern California, it was decided the program should be terminated. The major reason for this decision was the fact that even with selective drops at extremely high levels, the populations in several trouble spot fields continued to increase. This indicated that saturation of the valley by economically damaging populations was just a matter of time. When the Coachella program was terminated the entire sterile moth production was shifted to the area where adult moths had been found in the San Joaquin Valley in Kern County. As a result of the Coachella Valley studies, research and methods personnel gained valuable information on the competitiveness and length of survival time of moths sterilized at different dosages of radiation.

A total of 13 native pink bollworm adults and three larvae was found in the fall of 1970 in Kern County. The localized infestations found before October 1 were treated with limited applications of carbaryl in addition to the sterile releases. The insecticide applications were applied by the California Department of Agriculture. This phase of the program is not a part of the cooperative effort. The U.S. Department of Agriculture has not participated in a pesticide program to control the pink bollworm since 1967.

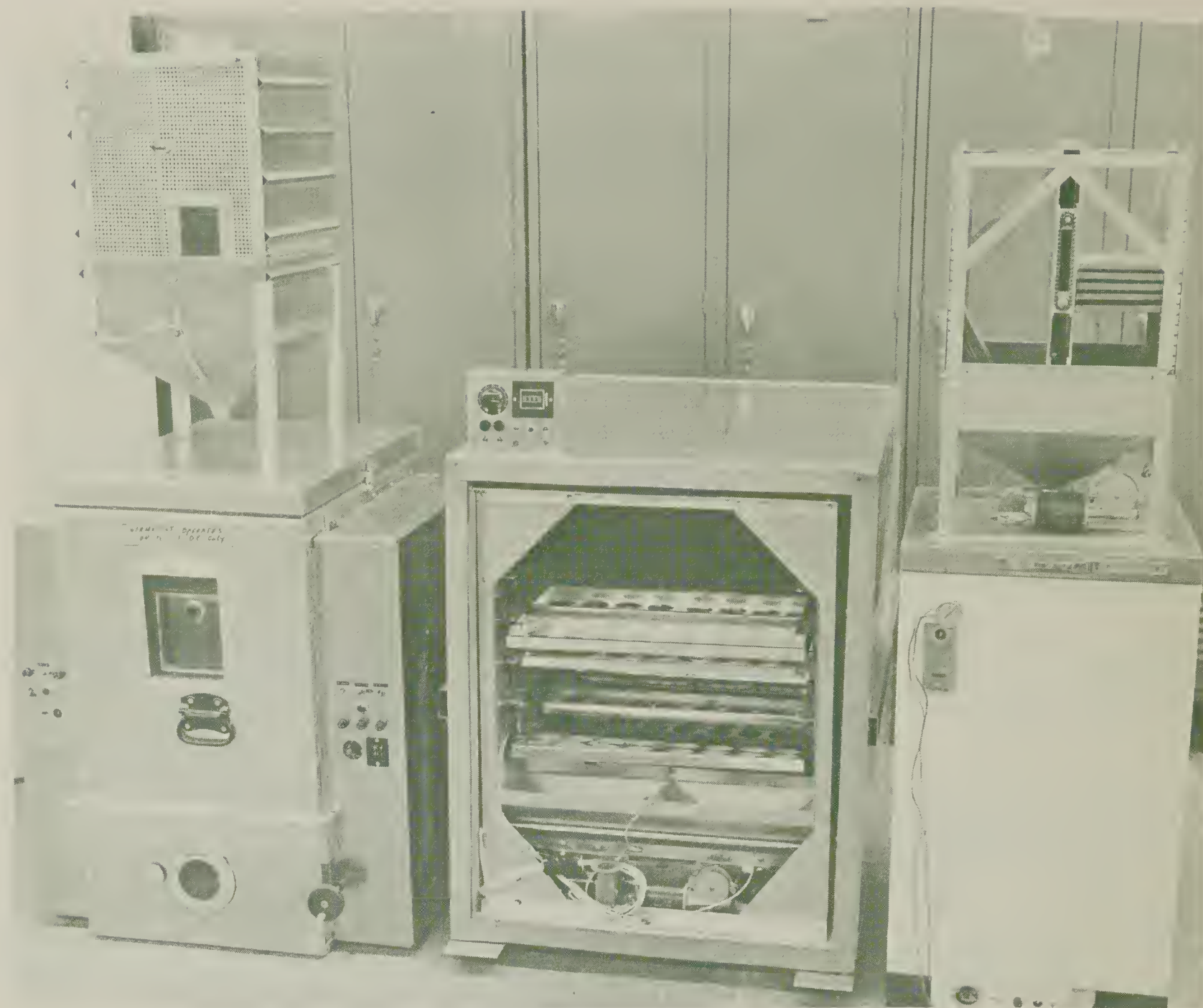
An intensive trapping program, using the highly effective synthetic sex attractant hexalure, was conducted in the San Joaquin Valley during 1970. The heaviest trapping was done in the areas where moths had been found previously and also well into the peripheral boundaries. The sterile moths, being marked, are readily distinguished from the native moths. Continued daily catches of sterile or native moths during the release program give an indication of population levels.

The trapping program was continued in Arkansas, Louisiana, Missouri, and other cotton-producing States that are east of the Mississippi River. All surveys in these States were negative in 1970. In Arkansas and Louisiana, surveys in 59 counties were negative for the third consecutive year.

The sterile male drop on wild cotton in Florida continued to hold populations to an extremely low level even though the host plants have not been removed. This is the second year on this trial.



Aircraft with free release tube connected to automatic machine inside the cabin.



Refrigerated automatic dispersal machines with capacities up to 1 million insects developed for free aerial release of sterile insects such as pink bollworm and Caribbean fruit fly.

PISTACHIO SEED CHALCID

The pistachio seed chalcid, Megastigmus pistaciae, was first found in the USDA Plant Introduction Station at Chico, Butte County, Calif., in September 1967. For the next 2 years, chemical and cultural control measures were taken against this pest at the Plant Introduction Station and surrounding environs. Nuts grown and harvested at the Station were inspected for exit holes and other evidence of infestation. An X-ray machine was later utilized to examine nuts for the presence of larvae. To determine the extent of spread, stickyboard traps were installed and visual surveys conducted throughout pistachio plantings in 23 counties in California.

In July 1969, specimens were first found in pistachio plantings outside the environs of the Plant Introduction Station. Also, multiple infestations were found in Orange and San Diego Counties, all within nuts of Pistacia chinensis. This ornamental tree is planted along streets and dooryards throughout California. Because of the widespread distribution of the chalcid, eradication efforts were discontinued in 1970. Control measures were not attempted and survey activities were limited to detection surveys (utilizing stickyboard traps) in pistachio plantings in 12 counties. This limited detection survey was supplemented with X-ray examination of nuts collected from commercial pistachio plantings. Both survey and X-ray results were negative.

RANGE CATERPILLAR

Heavy populations of the range caterpillar were found in 1970 in four northern New Mexico counties. This pest has periodically destroyed host grasses, primarily grama grass, in this area of the country since 1895. Ranchers in Colfax and Union Counties, N. Mex., conducted a control program on about 650,000 acres in 1970 using toxaphene at one-half pound per acre. A State-Federal-rancher cooperative program was not conducted because of unresolved problems concerning the use of toxaphene on rangeland.

A series of tests to find suitable nonpersistent insecticides was continued in 1970. Several compounds were found to be effective against late-larval stages. Additional tests are scheduled for 1971.

SOYBEAN CYST NEMATODE

The most effective controls for the soybean cyst nematode continue to be the use of resistant varieties and crop rotation. Research is being carried on to develop additional resistant varieties.

Surveys were conducted in all major soybean-producing States. Symptom surveys were made on 811,035 acres. Examination of soil samples showed 40,151 new acres infested on 181 properties. The pest was found in 14 new counties in five of the 11 infested States.

Regulatory inspections totaled 9,197 in 19 States. Nearly 5 million bushels of seed beans were certified for movement outside the regulated area. Over 6,700 pieces of equipment were treated and 473 transit inspections made.

SWEETPOTATO WEEVIL

A new infestation was detected in a storage facility in Tabor City, N.C., in December. It involved sweetpotatoes stored in a new warehouse. All sweetpotatoes were processed and trash and debris fumigated. This was the only known infestation in North Carolina. A similar infestation was detected in a storage facility at Tabor City in 1969. It was successfully eradicated by fumigation. In the eradication parishes of Louisiana, 113 new infestations

were detected. One hundred six properties were released from regulation. In Texas, no new infestations were detected in the eradication counties and three properties were released from regulation.

Tests are continuing at Louisiana State University to evaluate alternate control materials for treatment of sweetpotato beds and sweetpotatoes in storage. Furadan shows some promise for seedbed treatment and Imadan for use on potatoes in storage. New methods of control are urgently needed because of restrictions placed on the use of chlorinated hydrocarbon insecticides.

Researchers have not yet been successful in isolating and identifying a sex pheromone. A crude attractant can be produced from sweetpotato weevil body parts in a solvent. Early indications are that this may be used as a supplemental survey tool.

WEST INDIAN SUGARCANE ROOT BORER

Control efforts against the West Indian sugarcane root borer, Diaprepes abbreviatus, have been responsible for an 84 percent reduction of adults compared with 1969. The West Indian sugarcane root borer was detected at Apopka, Fla., in September 1968, and at Plymouth, Fla., in 1969. Although 32 new infested acres were detected in 1970, bringing the total to 1,235 acres, the increase was all within the regulated area. The first presence of this insect outside of citrus groves occurred near Apopka in the fall of 1970, when adults were observed on kudzu. All known infestations were treated in 1970 with 5 pounds actual chlordane insecticide incorporated into the soil. Repeat foliage applications of 2 pounds actual carbaryl per acre at 10-day intervals were made throughout the season whenever adult borers were detected. Citrus trees in seven groves within the infested area showed severe symptoms of decline during the prolonged dry spell in the fall of 1970. Trees were pulled and roots examined. Root girdling, evidence of West Indian sugarcane root borer damage, was observed. Most damage appears to have been caused by larvae which were in the soil before the chlordane soil application. Surveys in December in 20 groves revealed only five larvae in three groves.

Colonization of a parasite, Tetrastichus haitensis has been attempted by Entomology Research Division. Root borer eggs attacked by the parasites have been recovered.

Insecticide screening tests by the University of Florida are at a virtual standstill because of a lack of test insects. Attempts at laboratory rearing have been largely unsuccessful.



Citrus trees showing decline symptoms as a result of root damage by West Indian sugarcane root borer larval feeding.

WHITEFRINGED BEETLES

During the 1970 detection survey, infestations of whitefringed beetles were found for the first time in 28 counties in currently infested States. Eradication treatments were completed at several infested sites outside of the regulated area. These soil treatments utilized 10 percent granular dieldrin applied to the soil surface at the rate of 3 pounds actual per acre and 25 percent granular chlordane incorporated into the soil at the rate of 5 pounds actual toxicant per acre. Granular insecticide treatments were supplemented with carbaryl (Sevin 80-S) foliar sprays applied at 0.8 to 1 pound toxicant per acre. It was necessary to arrange with the National Park Service for the treating of over 400 cubic yards of topsoil with chlordane which had been moved to the Jefferson Memorial in Washington, D.C., from the infested area in Virginia.

Eradication treatments were applied at three nurseries in the Mobile, Ala. area that were infested with a strain of Graphognathus peregrinus resistant to chlorinated hydrocarbon insecticides. The soil fumigant D-D was used at the rate of 100 gallons per acre, dispensed in two applications of 50 gallons per acre. No beetles have been found since the treatment. Two other nurseries involved with the resistant strain will be treated with D-D in 1971. Entomology Research Division is continuing its study of the resistant strain to determine if the resistance factor is present in populations in other infested areas.

Candidate insecticides were screened for effectiveness against the beetle when used as a soil or plant dip treatment. An effective dip treatment for nursery stock must be developed. Several compounds show promise as a dip material but must undergo further testing to establish their value as a regulatory treatment.

A Southern Plant Board-ARS Study Committee completed an appraisal of the whitefringed beetle program. Briefly, their report noted that additional information is needed on the economic status of the beetle, survey techniques should be strengthened, and adjustments should be made in the practice of regulating numerous spot infestations. Further suggestions pertained to assessing damage caused by varying levels of larval populations on major host crops and the need for additional research on the biology, ecology, and control of the pest. A start was made in 1970 toward carrying out the committee's recommendations as they pertained to survey and regulatory operations and damage assessment.

WITCHWEED

Surveys in 1970 revealed only 4,933 new infested acres on 139 farms in North Carolina and South Carolina. No new counties were found infested. As a result of fumigating isolated infested fields and 3 years' negative survey, three counties in North Carolina and two counties in South Carolina were removed from the regulated areas.

During the year a total of 376,752 acres was treated with 2,4-D at the rate of 1/2 to 1 pound per acre with high clearance and other ground spray equipment for witchweed control. This is a reduction of 89,643 acres that required treatment in 1969. In early July, paraquat, a desiccant, was applied to approximately 750 acres on 65 scattered fields at the rate of 1/2 pound per acre. Varying degrees of success were obtained probably because of adverse weather conditions. Of the 65 fields treated, 21 required further treatment during the season. The practice of fumigating small isolated witchweed infestations was continued by treating 173 acres in North Carolina and South Carolina. Methyl bromide was used at the rate of 15 pounds per 1,000 square feet.

INSECT DETECTION AND SERVICE SURVEYS

During 1970, there were 11 species of insects reported for the first time in the United States. Eight were new to the Western Hemisphere--seven in Hawaii and one in New York. One of the new species, the asparagus aphid (Brachycolus asparagi) was first reported infesting asparagus seedlings at Rutgers, N.J. It was subsequently determined that a single specimen was previously collected on Long Island, N.Y. Detection surveys for this potentially serious pest of asparagus established a widespread distribution including New Jersey, Pennsylvania, and Virginia. In addition to the new United States records, there were 123 new State records reported.

Cooperative survey agreements were established with six additional States during the year. This increased the number of States with such agreements to 40--27 standard (survey entomologist employed) and 13 modified. Cooperators submitted approximately 1,650 weekly insect condition reports for the "Cooperative Economic Insect Report" and for inclusion in the Scientific Records System. Program Aid 929 "Watch for New Small Grain Insects" and a detection poster "Report Unfamiliar Insects" were issued during the year.

In the Western Region, State survey coordinators, survey entomologists, and Division personnel participated in a workshop to discuss problems associated with the cooperative economic insect survey program. This was the first workshop of this nature ever held.

Insect detection was strengthened at key entry points by the placement of blacklight traps at 15 major military installations throughout the United States. This cooperative Federal-State-military undertaking is designed to detect foreign insect pests which might be introduced into the country as "hitchhikers" on military cargo returning from Southeast Asia. An improved black light trap was designed cooperatively with Agricultural Engineering Research Division for use in future detection activities. These traps can be operated interchangeably on AC or battery current.

Service surveys for beet leafhopper, potato psyllid, and boll weevil continued during the year. Surveys for beet leafhopper adults in the overwintering desert areas of southern Utah and Nevada, southeastern California, and central Arizona began in February. Based on these surveys, movement to the northern cultivated host crop areas was predicted to be light to moderate. Population levels were at such a low level in Idaho that control measures were not needed in 1970. The survey in Texas showed that population levels there were approximately 50 percent less than in 1969.

The survey for potato psyllid was conducted in early March in the spring breeding areas of Arizona and California, and in April in western Texas. A light to moderate migration was forecast.

Each year, surface ground trash samples (from woods) are collected in the fall and spring in six Southern States by State and Federal agencies to estimate the number of boll weevil adults entering hibernation and those that survive the winter. Spring survival in 1970 decreased from that of 1969 in all areas of North Carolina, South Carolina, the Central and South Deltas, and Hill Section of Mississippi, northeastern Louisiana, and central Texas. Survival increased about fivefold in the North Delta of Mississippi. The average number of boll weevils entering hibernation in the fall of 1970 was higher than in the fall of 1969 in the Coastal Plain of the Carolinas, the Central and South Deltas and Hill Section of Mississippi, northeastern Louisiana, and central Texas. Counts were lower in south-central South Carolina, the Piedmont of the Carolinas, north-central North Carolina, southern Tennessee, and the North Delta of Mississippi.

ENVIRONMENTAL QUALITY PROGRAM

More emphasis was placed on special studies in 1970 since there was a lack of funds to fully initiate the nationwide soil monitoring program. Paired soil and crop samples were collected in the Corn and Cotton Belts. Sugar beet pulp was sampled at all sugar beet processing plants in the Central and Western Regions. Feed was sampled from cattle feedlots in the Central, Western, and Southern Regions. In the Eastern Region, soil and crops were sampled from vegetable-growing areas and orchards. Soil was sampled from 14 cities throughout the United States.

PPD, the Bureau of Commercial Fisheries, and the Bureau of Sport Fisheries and Wildlife of the U.S. Department of the Interior conducted a cooperative study on pesticide residues in commercially produced catfish in Arkansas and Mississippi. Samples of fish, water, sediment, and commercial feed were collected and analyzed at 145 sites in these two States.

A survey of the waste disposal practices of pesticide formulators and manufacturers in the Delaware River Basin revealed that pesticides were being discharged in the sewage effluent from Philadelphia. No pesticide formulators or manufacturers were found in Delaware. In New Jersey, it appeared that one firm may have contributed DDT residues to the aquatic environment. The results of this cooperative survey with the State Departments of Agriculture of New Jersey, Delaware, and Pennsylvania were provided to the States.

Special monitoring studies were conducted on wheat, sweetpotatoes, and onions. There appears to be little or no problem with chlorinated hydrocarbon or organophosphate residues in wheat and in the soil in which it is grown. Minimal pesticide residues were found in sweetpotatoes and pesticide contamination of the sweetpotato crop does not seem to be a problem. Soils on which onions are grown carried heavy loads of pesticides (an average DDT residue level of 15.1 ppm in 95.8 percent of the soil samples and an average of 0.79 ppm of dieldrin in 73.2 percent of the soil samples). There was no detectable movement of pesticides from the soil into the onions and none of the onion samples contained detectable chlorinated hydrocarbon or organophosphate pesticide residues.



One step in pesticide residue analysis in Environmental Quality Program monitoring activity.

Table 1.--Barberry eradication--calendar year 1970

State	Survey	Control		Regulatory
	Area surveyed	Plants destroyed	Area placed on maintenance	Nursery inspections
	Square miles	Number	Square miles	Number
Alabama	-----	-----	-----	30
Arizona	-----	-----	-----	19
Arkansas	-----	-----	-----	1
California	-----	-----	-----	69
Colorado	10	728	7	20
Connecticut	-----	-----	-----	33
Delaware	-----	-----	-----	25
District of Columbia	-----	-----	-----	1
Florida	-----	-----	-----	17
Georgia	-----	-----	-----	33
Illinois	91	240	65	39
Indiana	57	5	51	8
Iowa	184	743	741	15
Kansas	725	19	721	20
Kentucky	-----	-----	-----	15
Louisiana	-----	-----	-----	40
Maine	-----	-----	-----	6
Maryland	-----	-----	-----	29
Massachusetts	-----	-----	-----	18
Michigan	158	732	77	36
Minnesota	90	314	153	29
Mississippi	-----	-----	-----	29
Missouri	20	-----	21	7
Montana	13	53	-----	-----
Nebraska	41	9	15	3
New Hampshire	-----	-----	-----	6
New Jersey	-----	-----	-----	67
New York	-----	-----	-----	32
North Carolina	-----	-----	-----	11
North Dakota	1	-----	1	-----
Ohio	42	917	22	118
Oklahoma	-----	-----	-----	22
Oregon	-----	-----	-----	37
Pennsylvania	713	6,085	687	50
Rhode Island	-----	-----	-----	69
South Carolina	-----	-----	-----	1
South Dakota	4	3	-----	1
Tennessee	-----	-----	-----	65
Texas	-----	-----	-----	12
Utah	-----	-----	-----	5
Vermont	-----	-----	-----	13
Virginia	24	715,903	1	56
Washington	120	1,235	54	32
West Virginia	67	2,450,802	2	26
Wisconsin	87	416	156	5
Wyoming	10	-----	-----	-----
Total	2,457	3,178,204	2,774	1,165

Table 2.--Boll weevil--calendar year 1970

United States and Mexico	Survey and detection	Control
	Area visually surveyed	Area treated
	<u>Acres</u>	<u>Acres</u> <u>1/</u>
United States:		
Arizona	20,841	-----
New Mexico	2,356	-----
Texas	1,224,460	1,171,497
Mexico	6,763	3,040
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Total	1,254,420	1,174,537

1/ Aggregate acres.

Table 3.--Cereal leaf beetle--calendar year 1970

State	Survey and detection	Control
	Area surveyed	Area treated
	<u>Acres</u>	<u>Acres</u>
Alabama	2,363	-----
Arkansas	3	-----
Connecticut	113	-----
Delaware	4,756	-----
Illinois	124,022	118,122
Indiana	315	-----
Iowa	6,238	-----
Kentucky	-----	1
Louisiana	70	-----
Maryland	5,741	-----
Massachusetts	516	-----
Minnesota	1,500	-----
Mississippi	7,255	-----
New Jersey	822	-----
North Carolina	394	-----
Rhode Island	275	-----
South Carolina	20	-----
Tennessee	12,038	-----
Texas	8,565	-----
Virginia	12,731	-----
West Virginia	360	-----
Wisconsin	11,085	-----
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Total	199,182	118,123

Table 4.--Citrus blackfly--calendar year 1970

United States and Mexico	Survey and detection		Control
	Trees examined	Trees infested	Host plants treated
	<u>Number</u>	<u>Number</u>	<u>Number</u>
United States:			
Arizona	73	-----	-----
Texas	12,482	-----	-----
Mexico	1,628,908	54,143	792,699
Total	1,641,463	54,143	792,699

Table 5.--European chafer--calendar year 1970

State	Survey and detection	Control	Regulatory	
	Sites trapped	Area treated	Area treated	Nursery and other inspections
	<u>Number</u>	<u>Acres</u>	<u>Acres</u>	<u>Number</u>
California	-----	-----	-----	1
Connecticut	117	-----	27	19
Delaware	16	-----	-----	-----
Illinois	-----	-----	-----	112
Indiana	-----	-----	-----	44
Iowa	-----	-----	-----	4
Maine	96	-----	-----	-----
Maryland	40	-----	-----	26
Massachusetts	400	754	2	47
Michigan	10	-----	-----	-----
New Hampshire	16	-----	-----	-----
New Jersey	132	-----	-----	-----
New York	405	-----	<u>1/</u> 31	426
Ohio	356	39	10	25
Pennsylvania	37	-----	-----	22
Rhode Island	195	87	-----	-----
Vermont	27	-----	-----	-----
Virginia	19	-----	-----	28
West Virginia	10	-----	-----	-----
Total	1,876	880	70	754

1/ Does not include 40 acres foliage treatment.

Table 6.--Golden nematode--calendar year 1970

State	Survey and detection		Control	Regulatory
	Area surveyed	Samples taken	Area fumigated	Potato grader inspections
	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>
Alabama	-----	41	-----	-----
Delaware	1,534	2,014	-----	-----
Florida	168	20	-----	-----
Maine	21,920	4,529	-----	-----
Maryland	323	412	-----	-----
Massachusetts	2,005	244	-----	-----
Michigan	7,890	789	-----	-----
New Jersey	3,420	1,303	-----	-----
New York	32,899	43,163	403	878
North Carolina	376	354	-----	-----
Pennsylvania	4,565	913	-----	-----
Rhode Island	1,352	164	-----	-----
Virginia	2,123	2,744	-----	-----
West Virginia	101	139	-----	-----
Total	78,676	56,829	403	878

Table 7.--Grasshopper control--calendar year 1970

State	Survey and detection		Control
	Area infested 1/		Area treated
	<u>Acres</u>		<u>Acres</u>
Arizona	139,200		67,390
California	332,109		4,071
Colorado	310,000		-----
Idaho	1,683,000		25,098
Kansas	30,000		-----
Montana	116,000		-----
Nebraska	30,000		5,184
Nevada	46,120		-----
New Mexico	95,000		-----
Oklahoma	2,300,000		-----
Oregon	33,960		-----
Texas	2,311,340		-----
Utah	64,610		-----
Washington	306,500		18,909
Wyoming	130,200		11,232
Total	7,928,039		131,884

1/ Adult survey, 1970.

Table 8.--Gypsy moth--calendar year 1970

State	Survey and detection	Control		Regulatory	
	Sites trapped <u>Number</u>	Area treated chemically <u>Acres</u>	Parasites released 1/ <u>Number</u>	Nursery and other inspections <u>Number</u>	Commodity treatments <u>Number</u>
Alabama	100	-----	-----	3	-----
Arizona	13	-----	-----	5	-----
Arkansas	95	-----	-----	4	-----
California	654	1	-----	65	2
Connecticut	1,857	1,207	-----	4,166	256
Delaware	3,481	-----	266	29	-----
District of Columbia	-----	-----	-----	2	-----
Florida	10	-----	-----	120	3
Georgia	191	-----	-----	11	-----
Idaho	-----	-----	-----	2	-----
Illinois	50	-----	-----	65	5
Indiana	50	-----	-----	50	1
Iowa	18	-----	-----	-----	1
Kansas	-----	-----	-----	3	-----
Kentucky	-----	-----	-----	34	12
Louisiana	18	-----	-----	3	-----
Maine	280	-----	-----	1,255	929
Maryland	7,039	-----	370	154	1
Massachusetts	522	-----	36	818	28
Michigan	26	-----	-----	-----	35
Minnesota	19	-----	-----	7	2
Mississippi	-----	-----	-----	2	-----
Missouri	12	-----	-----	2	2
Nebraska	-----	-----	-----	1	-----
New Hampshire	142	-----	-----	1,069	396
New Jersey	1,934	132,473	50,793	3,938	251
New Mexico	-----	-----	-----	3	-----
New York	11,188	18,388	10	2,354	780
North Carolina	102	-----	-----	52	-----
Ohio	50	-----	-----	169	5
Oklahoma	-----	-----	-----	5	-----
Oregon	-----	-----	-----	2	-----
Pennsylvania	21,478	3,600	80	3,241	13
Rhode Island	549	-----	-----	566	6
South Carolina	16	-----	-----	57	1
Tennessee	194	-----	-----	35	-----
Texas	25	-----	-----	27	1
Utah	-----	-----	-----	1	-----
Vermont	697	-----	-----	1,407	455
Virginia	7,268	-----	270	51	1
Washington	-----	-----	-----	6	-----
West Virginia	3,000	-----	-----	20	-----
Wisconsin	50	-----	-----	8	3
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	61,128	155,669	51,825	19,812	3,189

1/ Units of 1,000

Table 9.--Imported fire ant--calendar year 1970

State	Survey and detection	Control		Regulatory			
		Area surveyed	Area treated	Nursery inspections	All other inspections	Commodity treatments	Pesticide treatments soil
		<u>Acres</u>	<u>Acres</u> <u>1/</u>	<u>Number</u>	<u>Number</u>	<u>Number</u>	<u>Acres</u>
Alabama	1,013,695		396,806	2,303	2,768	164	2,989
Arizona	-----		-----	-----	2	-----	-----
Arkansas	1,776,941		104,668	10	13	-----	-----
California	100		-----	-----	15	-----	-----
Florida	20,218		-----	1,943	1,308	491	3,113
Georgia	7,812,502		8,241,977	617	626	304	1,294
Illinois	-----		-----	-----	115	-----	-----
Indiana	-----		-----	-----	48	4	-----
Iowa	-----		-----	-----	4	-----	-----
Louisiana	2,470,242		1,366,587	1,293	690	50	1,107
Maryland	-----		-----	-----	26	-----	-----
Massachusetts	-----		-----	-----	1	-----	-----
Mississippi	4,384,914		1,667,256	1,171	1,119	1,092	617
North Carolina	1,127,530		11,800	32	169	11	19
Ohio	1		-----	-----	12	1	-----
Oklahoma	4,130		-----	-----	-----	-----	-----
South Carolina	2,641,642		2,755,942	37	145	996	248
Tennessee	1,035,350		-----	-----	39	1	-----
Texas	2,456,452		113,604	2,553	1,064	169	1,345
Virginia	806		-----	3	47	-----	-----
Washington	-----		-----	10	-----	-----	-----
Total	24,744,523		14,658,640	9,972	8,211	3,283	10,732

1/ Aggregate acres.

Table 10.--Japanese beetle--calendar year 1970

State	Survey and detection			Control	Regulatory	
	Area surveyed	Sites trapped	Area infested outside regulated area	Area treated chemically	Area treated soil	Commodity treatments
	Acres	Number	Acres	Acres	Acres	Number
Alabama	3,894	2,059	-----	11	-----	1
Arizona	-----	35	-----	-----	-----	-----
Arkansas	35	128	-----	-----	-----	-----
California	-----	3,565	-----	-----	-----	-----
Colorado	-----	48	-----	-----	-----	-----
Connecticut	326	-----	-----	-----	432	43
Delaware	-----	-----	-----	-----	-----	50
District of Columbia	-----	-----	-----	-----	-----	62
Florida	-----	114	-----	-----	-----	-----
Georgia	500	977	360,500	57	148	137
Hawaii	-----	16	-----	-----	-----	-----
Idaho	-----	4	-----	-----	-----	-----
Illinois	40	4,157	45,632	1,100	-----	-----
Indiana	14	4,865	123,827	-----	1,241	43
Iowa	-----	1,817	-----	-----	-----	-----
Kansas	-----	136	-----	-----	-----	-----
Kentucky	241	3,650	295	105	396	3
Louisiana	-----	112	-----	-----	-----	-----
Maine	-----	120	-----	-----	2	5
Maryland	278	-----	-----	-----	34	3,191
Massachusetts	712	-----	-----	-----	9	135
Michigan	-----	12,473	12,188	3,154	8	-----
Minnesota	-----	1,204	-----	-----	-----	-----
Mississippi	-----	165	-----	-----	-----	-----
Missouri	632	2,286	100	423	-----	-----
Nebraska	-----	47	-----	-----	-----	-----
Nevada	-----	15	-----	-----	-----	-----
New Hampshire	-----	-----	-----	-----	-----	7
New Jersey	382	-----	-----	-----	291	145
New York	-----	-----	-----	-----	69	98
North Carolina	63	8	-----	65	318	1,403
North Dakota	-----	76	-----	-----	-----	-----
Ohio	3,619	4,031	-----	278	761	57
Oklahoma	-----	50	-----	-----	-----	-----
Oregon	-----	177	-----	-----	-----	-----
Pennsylvania	336	-----	-----	-----	12	95
Rhode Island	276	-----	-----	-----	57	6
South Carolina	155	657	34,800	-----	219	8
South Dakota	-----	155	-----	-----	-----	-----
Tennessee	19,826	2,638	89,785	-----	219	55
Texas	-----	147	-----	-----	-----	-----
Vermont	-----	-----	-----	-----	-----	2
Virginia	-----	-----	-----	-----	1,130	121
Washington	-----	55	-----	-----	-----	-----
West Virginia	-----	-----	-----	-----	1	0
Wisconsin	-----	320	-----	-----	-----	-----
Total	31,384	46,977	667,127	5,193	5,347	5,613

Table 11.--Khapra beetle--calendar year 1970

United States and Mexico	Survey and detection	Regulatory
	Properties surveyed	Commodity treatments
	<u>Number</u>	<u>Number</u>
United States:		
Alabama	8	-----
Arizona	1,778	-----
Arkansas	53	-----
California	2,290	-----
Connecticut	-----	1
Delaware	2	-----
Florida	5	-----
Georgia	13	-----
Hawaii	18	-----
Illinois	38	-----
Kentucky	8	2
Louisiana	404	-----
Mississippi	8	-----
Missouri	1	-----
New Jersey	19	-----
New Mexico	295	-----
North Carolina	2	-----
North Dakota	7	-----
Ohio	6	11
Oklahoma	302	-----
Pennsylvania	-----	1
South Dakota	4	-----
Tennessee	15	-----
Texas	210	-----
Virginia	2	-----
Washington	251	-----
Mexico	2,153	284
Total	7,892	299

Table 12.--Mediterranean fruit fly--calendar year 1970

United States and Mexico	Survey and detection
	Traps
	installed
	<u>Number</u>
United States:	
Arizona	87
California	793
Florida	31,352
Georgia	26
Louisiana	30
North Carolina	30
South Carolina	4
Texas	658
Mexico	4,100
Total	37,080

Table 13.--Mexican fruit fly--calendar year 1970

United States and Mexico	Survey and detection		Control	Regulatory
	Traps	Area	Biological sterile	Commodity
	installed	infested	flies released 1/	treatments
	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Number</u>
United States:				
Arizona	131	-----	-----	-----
California	2,717	-----	10	-----
Florida	888	-----	-----	-----
Louisiana	25	-----	-----	-----
Texas	3,439	5,901	-----	298
Mexico	1,270	66,177	23,330	5,054
Total	8,470	72,078	23,340	5,352

1/ Units of 1,000.

Table 14.--Peach mosaic--calendar year 1970

State	Survey and detection	Control	Regulatory
	Hosts examined	Trees removed	Nursery inspections
	<u>Number</u>	<u>Number</u>	<u>Number</u>
Arizona	120,701	-----	9
California	4,954	-----	-----
Colorado	665,628	103	-----
Missouri	458,412	-----	-----
Oklahoma	90	-----	30
Texas	262,001	3	37
Utah	21,889	1	-----
Total	1,533,675	107	76

Table 15.--Phony peach--calendar year 1970

State	Survey and detection		Control		Regulatory
	Hosts examined	Hosts positive	Area treated	Trees removed	Nursery sites approved
	<u>Number</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Number</u>
Arkansas	306,809	25	-----	25	12
Georgia	2,272,611	8,057	10	8,057	-----
Louisiana	92,544	498	-----	673	-----
Mississippi	45,781	988	67	533	-----
Missouri	17,070	-----	-----	-----	-----
North Carolina	5,000	-----	-----	-----	-----
South Carolina	1,270,850	422	123	422	-----
Texas	185,498	22	-----	22	3
Total	4,196,163	10,012	200	9,732	15

Table 16.--Pink bollworm--calendar year 1970

United States and Mexico	Survey and detection		Control	Regulatory
	Bloom-boll survey	Trap installed		
	Acres	Number	Acres	
United States:				
Alabama	-----	269	-----	1
Arizona	11,306	183	359,727	108
Arkansas	-----	1,432	1,078,514	80
California	245,631	14,479	308,076	465
Florida	-----	128	-----	-----
Georgia	-----	369	-----	-----
Kentucky	-----	50	-----	-----
Louisiana	-----	2,265	36,354	10
Mississippi	950	948	-----	7
Missouri	-----	371	-----	-----
Nevada	-----	28	2,298	-----
New Mexico	1,611	20	-----	9
Oklahoma	-----	-----	-----	24
South Carolina	-----	420	-----	-----
Tennessee	4,330	538	-----	455
Texas	44,766	2	1,454,393	778
Virginia	27	-----	-----	-----
Mexico	85,963	1,265	545,536	4,797
Total	394,584	22,767	3,784,898	6,734

Table 17.--Soybean cyst nematode--calendar year 1970

State	Survey and detection			Regulatory
	Area surveyed	Samples taken	Area infested	Commodity treatments
	<u>Acres</u>	<u>Number</u>	<u>Acres</u>	<u>Number</u>
Alabama	74,154	8	-----	-----
Arkansas	140,808	1,337	-----	112
Delaware	10	6	-----	-----
Florida	1,680	76	70	-----
Illinois	36,539	4,909	1,172	7
Indiana	5,230	701	864	-----
Iowa	98,107	-----	-----	-----
Kentucky	9,001	1,055	2,883	4
Louisiana	112,865	1,311	1,165	12
Maryland	8	142	-----	-----
Mississippi	168,518	866	16,381	30
Missouri	67,960	505	-----	17
North Carolina	65,406	1,782	12,738	1,263
Ohio	255	-----	-----	-----
Oklahoma	7,130	-----	-----	3
Tennessee	18,469	281	4,475	161
Texas	3,985	-----	-----	-----
Virginia	910	2,115	403	10
Total	811,035	15,094	40,151	1,619

Table 18.--Whitefringed beetles--calendar year 1970

State	Survey and detection		Control Area treated 1/ Acres	Commodity treatments Number	Regulatory		
	Area surveyed Acres	Area infested Acres			Area treated soil	Area treated foliage Acres	
Alabama	306,297	19,280	2,000	213	5,043	11,988	
Arkansas	11,997	7,829	310	-----	79	-----	
Delaware	131	-----	-----	-----	-----	-----	
District of Columbia	49	-----	-----	-----	-----	-----	
Florida	20,850	100	-----	44	994	-----	
Georgia	61,417	13,827	43	1,123	1,073	-----	
Illinois	155	-----	-----	-----	-----	-----	
Indiana	-----	-----	-----	4	-----	-----	
Iowa	-----	-----	-----	1	-----	-----	
Kentucky	9,387	54	2	-----	-----	-----	
Louisiana	20,121	9,709	1,662	30	584	3,090	
Maryland	1,925	-----	-----	-----	-----	-----	
Massachusetts	-----	-----	-----	1	-----	-----	
Mississippi	130,313	1,073	216	1,268	823	-----	
Missouri	12,121	70	3	-----	-----	-----	
New Jersey	30	-----	-----	-----	-----	-----	
North Carolina	23,425	3,567	707	1,066	259	-----	
Ohio	85	-----	-----	-----	-----	-----	
Oklahoma	390	-----	-----	-----	-----	-----	
Pennsylvania	118	-----	-----	-----	-----	-----	
South Carolina	54,112	103	267	46	220	-----	
Tennessee	22,325	2,348	-----	138	588	4,478	
Texas	7,917	147	400	2	5	6	
Virginia	30,289	189	775	1,511	1,370	-----	
West Virginia	157	-----	-----	-----	-----	-----	
Total	713,611	58,296	6,385	5,447	11,038	19,562	

1/ Includes soil and surface and foliage.

Table 19.--Witchweed--calendar year 1970

State	Survey and detection		Control	Regulatory
	Area	Area	Area	Commodity
	surveyed	infested	treated	treatments
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u> <u>1/</u>	<u>Number</u>
Alabama	28,289	-----	-----	-----
Arkansas	2,985	-----	-----	-----
Delaware	70	-----	-----	-----
Georgia	1,390	-----	-----	-----
Illinois	20	-----	-----	-----
Louisiana	6,914	-----	-----	-----
Maryland	265	-----	-----	-----
Mississippi	30,370	-----	-----	-----
New Jersey	465	-----	-----	-----
North Carolina	288,082	4,747	308,022	3,109
Oklahoma	4,090	-----	-----	-----
Pennsylvania	578	-----	-----	-----
South Carolina	194,580	186	68,730	1,861
Tennessee	30,673	-----	-----	-----
Texas	4,457	-----	-----	-----
Virginia	8,209	-----	-----	-----
West Virginia	861	-----	-----	-----
Total	602,298	4,933	376,752	4,970

1/ Aggregate acres.